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ABSTRACT

Developed for educators and trainers in the U.S. Navy, this Instructional Quality Inventory (IQI) is designed to provide quality control and evaluation procedures for instructional development. A by-step instructional development approach is provided for each of five categories: objective adequacy, test consistency, test adequacy, presentation consistency, and presentation adequacy. Among other things, objective adequacy, test consistency, and presentation consistency are examined according to content type: face, concept, procedure, rule, or principle. The inventory concludes with checklists for each of the five inventory categories. For example, for objective adequacy the checklist inquires about the objective's correctness, classification, and appropriateness. (CSS)

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# THE INSTRUCTIONAL QUALITY INVENTORY: IV. JOB PERFORMANCE AID

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## FOREWORD

The Instructional Quality Inventory (IQI) was developed in support of Navy Decision Coordinating Paper, Education and Training Development (NDCP-Z0108-PN), under subproject P.30A, Adaptive Experimental Approach to Instructional Design, and the sponsorship of the Director of Naval Education and Training (OP-99). The overall objective of the subproject is to develop an empirically-based instructional design support system to aid developers in deciding on instructional alternatives based on cost/benefits and specified resource limitations. The purpose of the IQI, which was originally called the Instructional Strategy Diagnostic Profile (ISDP), is to provide quality control and/or evaluation procedures for instructional development.

A number of reports have been published on the IQI/ISDP. The first provided an interim training manual for the ISDP (NPRDC Special Report 77-14), and the next three addressed its empirical and workshop evaluations (NPRDC Technical Reports 77-25 and 77-43 and Special Report 78-17). As a result of these evaluations, the ISDP was extensively revised and retitled as the IQI. These revisions were included in NPRDC Technical Note 78-5, which provided an interim training manual for the IQI.

This report is the fourth in a series of four on IQI procedures. It provides a Job Performance Aid for the IQI process, including a list of all the IQI procedures. The other three reports are:

1. The Instructional Quality Inventory: Volume I, Introduction and Overview (NPRDC Special Report 79-3).

2. An IQI User's Manual, which will include a complete description of all IQI procedures, and provide examples of their use (to be published in early 1979).

3. An IQI Training Workbook, which will provide additional examples, and practice on the IQI procedures (to be published in early 1979).

When these four reports have been published, previous training manuals (NPRDC Special Report 77-14 and Technical Note 78-5) will have been superseded.

The IQI is intended for use by the Chief of Naval Education and Training; the Chief of Naval Technical Training; the Chief of Naval Education and Training Support (specifically, the Instructional Program Development Centers); the Commander Training Command, Atlantic; the Commander Training Command, Pacific; and all other Navy activities concerned with the development, revision, or acquisition of instructional programs. Prospective users of the IQI are invited to contact this command for assistance in implementation.

DONALD F. PARKER
Commanding Officer

CONTENTS


Objective Adequacy . . . . . card 1

Test Consistency . . . . . card 2

Test Adequacy . . . . . card 3

Presentation Consistency . . . . . card 4

Presentation Adequacy . . . . . card 5

IQI Rating Forms . . . . . page 1

Objective Adequacy Rating Form . . . . . 1
Test Consistency and Adequacy Rating Form . . . . . 2
Presentation Consistency and Adequacy Rating Form . . . . . 3

REFERENCES

DISTRIBUTION LIST

# OBJECTIVE ADEQUACY

INSTRUCTIONAL QUALITY INVENTORY

CARD 1

STEP 1: ENTER the COURSE TITLE and OBJECTIVE NUMBER at the top of the form.

STEP 2: Determine whether or not the OBJECTIVE is CORRECTLY STATED.

2a: Are the CONDITIONS under which student performance is expected specified?

*ENVIRONMENT:* PHYSICAL (weather, time of day, lighting, etc.)
SOCIAL (isolation, individual, team, audience, etc.)
PSYCHOLOGICAL (fatigue, stress, relaxed, etc.)

*INFORMATION:* GIVEN INFORMATION (scenario, formula, values, etc.)
CUES (signals for starting or stopping)
SPECIAL INSTRUCTIONS

*RESOURCES:* JOB AIDS (cards, charts, graphs, checklists, etc.)
EQUIPMENT, TOOLS
TECHNICAL MANUALS

2b: Are the STANDARDS which the student performance must meet specified?

*PERFORMANCE:* COMPLETENESS (how much of the task must be performed)
ACCURACY (how well must each task be performed)
TIME LIMIT (how much time is allowed)
RATE (how fast must task be done)

*PRODUCT:* COMPLETENESS (what must finished product contain)
QUALITY (what objective standard must product meet)
JUDGEMENT (what subjective opinions must product satisfy)

2c: Is the ACTION the student must perform specified?

Is an action verb used to specify what the student must do?

Is only one action stated in the objective?

STEP 3: Determine whether or not the OBJECTIVE is CLASSIFIABLE? Does the OBJECTIVE fit in one and only one cell of the table below?

| | FACT<br>RECALL OR RECOGNIZE NAMES, PARTS, DATES, PLACES, ETC. | CONCEPT<br>REMEMBER CHARACTERISTICS, OR CLASSIFY OBJECTS, EVENTS OR IDEAS ACCORDING TO CHARACTERISTICS | PROCEDURE<br>SEQUENCE OF STEPS REMEMBERED OR USED IN A SINGLE SITUATION OR ON A SINGLE PIECE OF EQUIPMENT | RULE<br>REMEMBER OR USE A SEQUENCE OF STEPS WHICH APPLY ACROSS SITUATIONS OR ACROSS EQUIPMENTS | PRINCIPLE<br>REMEMBER, OR INTERPRET OR PREDICT, WHY OR HOW THINGS HAPPEN, OR CAUSE-EFFECT RELATIONSHIPS |
|---|---|---|---|---|---|
| REMEMBER - RECALL OR RECOGNIZE FACTS, CONCEPT DEFINITIONS, STEPS OF PROCEDURES OR RULES, STATEMENTS OF PRINCIPLE | | | | | |
| USE-UNAIDED - TASKS WHICH REQUIRE CLASSIFYING, PERFORMING A PROCEDURE, USING A RULE, EXPLAINING OR PREDICTING WITH NO AIDS EXCEPT MEMORY. | | | | | |
| USE-AIDED - SAME AS USE-UNAIDED, EXCEPT JOB AIDS ARE AVAILABLE. | | | | | |

*(Continued on other side)*

STEP 4: Determine whether or not the OBJECTIVE is APPROPRIATE?

4a: Are the CONDITIONS appropriate for the work to be performed on the job or for later training?

4b: Are the STANDARDS appropriate for the work to be performed on the job or for later training?

4c: Is the TASK LEVEL of the ACTION appropriate for the work to be performed on the job or for later training?

4d: Is the CONTENT TYPE of the ACTION appropriate for the work to be performed on the job or for later training?

4e: If this objective is REMEMBER, is there a later USE objective?

4f: If this objective is USE-UNAIDED, is there a previous REMEMBER objective?

4g: If this objective is USE-AIDED, is the aid adequate, or are other objectives on the aid included?

*Note, if the answer to 4d, 4e, or 4g is yes, and if the associated objective is be taught in the present course, evaluate that objective next and keep the related objectives together throughout the IQI evaluation.*

INSTRUCTIONAL
QUALITY
INVENTORY

# TEST CONSISTENCY

CARD 2

STEP 1: ENTER the COURSE TITLE and OBJECTIVE NUMBER at the top of the form.

STEP 2: ENTER the TEST ITEM NUMBERS for the items associated with this objective on the form.

STEP 3: DETERMINE whether or not the CONDITIONS in each item, or the CONDITIONS under which the items are administered, match the conditions in the objective.

STEP 4: DETERMINE whether or not the STANDARDS in each item, or the STANDARDS for scoring each item, match the standards in the objective.

STEP 5: DETERMINE whether or not the ACTIONS in each item match the action of the objective.

STEP 5a: Determine the TASK LEVEL and CONTENT TYPE of each test item.

STEP 5b: Determine whether these match the TASK LEVEL and CONTENT TYPE of the objective.

STEP 6: DETERMINE whether or not each item is typical of the job to be performed after training, or is a necessary qualification for later training.

STEP 7: DETERMINE whether or not the FORMAT of each item is APPROPRIATE for the TASK LEVEL and CONTENT TYPE. Use the table below:

| *TASK LEVEL* | *CONTENT TYPE* FACT | CONCEPT | PROCEDURE | RULE | PRINCIPLE |
|---|---|---|---|---|---|
| REMEMBER | *for RECOGNITION:*<br>matching<br>true-false<br>multiple choice<br>*for RECALL:*<br>short answer<br>fill-in<br>listing | short answer<br>fill-in<br>listing | short answer<br>fill-in<br>listing | short answer<br>fill-in<br>listing | short answer<br>fill-in<br>listing |
| USE-UNAIDED | | performance<br>matching<br>true-false<br>multiple choice<br>short answer<br>fill-in | performance<br>true-false<br>multiple choice<br>short answer<br>fill-in | performance<br>true-false<br>multiple choice<br>short answer<br>fill-in | performance<br>true-false<br>multiple choice<br>short answer<br>fill-in |
| USE-AIDED | | performance<br>matching<br>true-false<br>multiple choice<br>short answer<br>fill-in | performance<br>true-false<br>multiple choice<br>short answer<br>fill-in | performance<br>true-false<br>multiple choice<br>short answer<br>fill-in | performance<br>true-false<br>multiple choice<br>short answer<br>fill-in |

# TEST ADEQUACY

CARL 3

STEP 1: DETERMINE whether or not each item is CLEAR. *Instructions for completing the item must specify what response the student is expected to make.*

STEP 2: DETERMINE whether or not each item is UNAMBIGUOUS. *Each item must have one and only one correct response, and the item must be interpretable in only one way. That is, items must not be confusing.*

STEP 3: DETERMINE whether or not each item is WELL CONSTRUCTED. *Different criteria apply to different item formats:*

| | |
|---|---|
| TRUE-FALSE items: | *An item should include only one statement to be judged true or false.*<br>*Negative statements should be avoided.*<br>*Don't use words like "never," "always," etc.*<br>*Item statements should be short.* |
| MULTIPLE CHOICE items: | *All alternatives should be plausible.*<br>*Negatives in the item stem should be highlighted.*<br>*Repetitive phrases should be placed in the stem, not in the alternatives.*<br>*Alternatives like "all of the above," "A and B only," should be avoided.* |
| MATCHING items: | *Instructions should explain the contents of each column, and explain the basis for matching.*<br>*Instructions should specify how many times each answer may be used.*<br>*The choice column should include extra answers unless answers may be used more than once.* |
| FILL-IN items: | *The blank should be at or near the end of the sentence.*<br>*One and only one phrase should correctly complete the item.*<br>*Multiple blanks should be avoided.*<br>*Blanks should require key words.* |
| SHORT ANSWER items: | *The required answer should be kept short.*<br>*The directions to the student should specify how the item will be scored.*<br>*The scoring key should identify allowable synonyms or alternatives.* |
| LISTING items: | *The directions should specify the number of things to be listed (if appropriate for the objective, and if the number of things is not a hint).*<br>*The directions should specify whether or not order is important. If so, the scoring key should score sequence separately.*<br>*The scoring key should identify allowable synonyms or alternatives, and should specify different weights if appropriate.* |
| PERFORMANCE items: | *The directions should clearly explain what the student is to do and how the item will be scored.*<br>*The scoring key must specify all criteria the performance must meet, such as completeness, accuracy, quality, time limit, rate, etc. If steps in the performance are scored, a checklist should be provided.* |

STEP 4: DETERMINE whether or not each item is FREE of HINTS. *An item should not give away the answer to itself or to any other item on the test. The grammar of multiple-choice and fill-in items should not give hints to answers.*

STEP 5: DETERMINE whether or not the items allow for COMMON ERRORS to be made.

STEP 6: For USE-level objectives, DETERMINE whether or not there are ENOUGH ITEMS to test the objective adequately, and to reflect the range of performance required on the job.

# PRESENTATION CONSISTENCY

STEP 1: ENTER the COURSE TITLE and OBJECTIVE NUMBER at the top of the form.

STEP 2: LOCATE the section of the presentation related to this objective.

STEP 3: DETERMINE if the required PRESENTATION COMPONENTS are present for the task level of the objective. (Use the table below).

| | *REQUIRED PRESENTATION COMPONENTS* | | | |
|---|---|---|---|---|
| *TASK LEVEL* | STATEMENT | PRACTICE REMEMBERING | EXAMPLES | PRACTICE USING |
| REMEMBER | *required* | *required* | *not required* | *not required* |
| USE-UNAIDED | *required unless the associated REMEMBER objective was taught recently* | | *required* | *required* |
| USE-AIDED | *the aid replaces statement* | *not required* | *required with aid* | *required with aid* |

STEP 4: DETERMINE whether or not each required PRESENTATION COMPONENT is COMPLETE for the content type of the objective (Use the table below). Examples and practice items must also match the task level of the objective.

| PRESENTATION COMPONENT | CONTENT TYPE OF THE OBJECTIVE | | | | |
|---|---|---|---|---|---|
| | FACT | CONCEPT | PROCEDURE | RULE | PRINCIPLE |
| STATEMENT | complete fact presented | all critical characteristics and their combination are given | all steps are given in the correct order | all steps and branching decisions are given in the correct order | all causes, effects, and relationships are given |
| PRACTICE REMEMBERING | recall or recognition required | recall of concept definition required | recall of all steps in correct order required | recall of all steps and branch decisions in correct order required | recall of all causes, effects, relationships required |
| | For all content types: Practice Remembering items must be the same as the test item. They must be the same format as the test item. All practice items must include feedback. | | | | |
| EXAMPLES | *not applicable* | examples show all critical characteristics required for classification, non-examples show absence of critical characteristics | application of the procedure must be shown and steps must be shown in the correct order | application of each step or branching decision must be shown in the correct order | interpretation or prediction based on causes, effects, and relationships must be shown |
| PRACTICE USING | *not applicable* | classification of both examples and non-examples is required | all steps must be performed in the correct order | all steps and branching decisions must be performed in the correct order | explanation or prediction based on the principle is required |
| | For all content types: Practice Using items must reflect what is to be done on the job or in later training. The task/content level, conditions, and standards must match the test item and objective. The practice item format must be the same as the test item format. All practice items must include feedback. | | | | |
| | For CONCEPTS, RULES, and PRINCIPLES: Some practice items should be different than either the test items or the examples. *(Common error items might be the same.)* | | | | |

INSTRUCTIONAL QUALITY INVENTORY

# PRESENTATION ADEQUACY

CARD 5

STEP 1: DETERMINE whether or not each required PRESENTATION COMPONENT meets the general ADEQUACY criteria below.

SEPARATED: Statements, Examples, or Practice must be SEPARATED from the rest of the instruction. *There are different ways components may be separated:*

a. *Set off the component with a box.*
b. *Use a different color or type face, or underline.*
c. *Place on a separate page, or in a special place on the page.*
d. *For audio, movies, or lectures, pause before introducing the component.*

IDENTIFIED: Statements, Examples, and Practice must be IDENTIFIED so the student knows what they are, and can locate them. *Labels can be used to identify different components:*

| | | |
|---|---|---|
| *Definition of ...* | *Example* | *Practice* |
| *Procedure for ...* | *Demonstration* | *Test Yourself* |
| *Key Point:* | | |

CLEARLY STATED: Statements, Examples, and Practice must be CLEARLY STATED so the student can understand them. *The following criteria should be used:*

a. *The READING LEVEL must be appropriate for the students.*
b. *The presentation should not be confusing, vague, or too wordy.*
c. *All essential information should be present; the student should not be referred to other places to obtain information.*
d. *All presentations should be PERFORMANCE-ORIENTED, not topic-oriented.*

STEP 2: DETERMINE whether or not each required PRESENTATION COMPONENT meets the specific ADEQUACY criteria below:

STATEMENTS:

HELP: In addition to the statement, the instruction should include something to help the student better understand and remember the statement. *Methods of providing help include:*

a. *Giving a MNEMONIC (memory trick) or other memory aid.*
b. *Representing the statement with pictures, symbols, flowcharts, etc.*
c. *Explaining how the statement relates to something the student already knows, how it fits in the course, why it is important.*
d. *Giving more explanation about what the statement means.*

CLEARLY STATED: In addition to the criteria above, statements for different content types must meet the criteria below:

CONCEPTS: Give a decision rule or search strategy for classification.
PROCEDURES: Each step should have only one action.
RULES: If a formula is used, symbols must be defined.

*(Continued on other side)*

**EXAMPLES:**

**HELP:** Examples should include additional information to help the student understand. *Some types of HELP for different CONTENT TYPES are given below:*

*HELP for CONCEPTS:*
- *Highlight critical characteristics.*
- *Explain the reasons for classification.*
- *Illustrate the use of the decision rule or search strategy.*

*HELP for PROCEDURES or RULES:*
- *Explain the steps.*
- *Give more information on how to perform each step.*
- *Give a demonstration of each step.*
- *Give flowcharts, tables, etc.*

*HELP for PRINCIPLES:*
- *Highlight important causes, effects, relationships.*
- *Give additional information about how the principle applies, or why it doesn't.*

**MATCHING:** (concepts only) Examples should be matched with non-examples according to the presence and absence of each critical characteristic.

**EASY to HARD:** Early examples should be simplified. Conditions and standards may be relaxed on early examples so the student can learn gradually.

**ENOUGH EXAMPLES:** There should be enough examples to cover the content area thoroughly.

- For CONCEPTS: At least one example-nonexample pair for each critical characteristic.
- For PROCEDURES or RULES: One example for each important step. examples for all possible branches or decisions.

**COMMON ERRORS:** Examples should show why common errors are wrong.

**PRACTICE REMEMBERING or PRACTICE USING:**

**FREE OF HINTS:** The practice items should not include anything that won't appear on the test, or on the job.

**EASY to HARD:** (USING only) Early practice items may be simplified, or conditions and standards may be relaxed. Final practice items should be typical of the job.

**COMMON ERRORS:** (USING only) Practice should include the opportunity for common errors, so they can be corrected.

**ENOUGH PRACTICE:** There should be enough practice so the student has an adequate opportunity to learn.

- For CONCEPTS: Practice for presence or absence of all critical characteristics.
- For PROCEDURES or RULES: Practice for all possible branches or decisions.

**FEEDBACK:** The FEEDBACK must be <u>SEPARATED</u> and <u>IDENTIFIED</u>.

**FEEDBACK HELP:** The FEEDBACK should include HELP like the help for examples.

*COURSE TITLE* *OBJECTIVE #*

# OBJECTIVE ADEQUACY

## OBJECTIVE CORRECTLY STATED?

*REVISIONS*

CONDITIONS *y* *n*

STANDARDS *y* *n*

ACTION *y* *n*

## OBJECTIVE CLASSIFIABLE? (IN ONE AND ONLY ONE WAY) *y* *n*

*(circle the classification)* *REVISIONS*

REMEMBER

USE-UNAIDED

USE-AIDED

FACT

CONCEPT

PROCEDURE

RULE

PRINCIPLE

## OBJECTIVE APPROPRIATE? (FOR JOB OR LATER TRAINING)

*REVISIONS*

CONDITIONS APPROPRIATE? *y* *n*

STANDARDS APPROPRIATE? *y* *n*

ACTION - TASK LEVEL APPROPRIATE? *y* *n*

- CONTENT TYPE APPROPRIATE? *y* *n*

if REMEMBER, is there a later USE objective? *y* *n*

if USE-UNAIDED, is there a previous REMEMBER objective? *y* *n*

if USE-AIDED, is the aid adequate, or are other objectives on the aid included? *y* *n*

*COURSE TITLE* *OBJECTIVE #*

# TEST CONSISTENCY AND ADEQUACY

| CONSISTENCY | *test item #___* | *revisions* | *test item #___* | *revisions* | *test item #___* | *revisions* |
|---|---|---|---|---|---|---|
| CONDITIONS SAME (as objective)? | *y n* | | *y n* | | *y n* | |
| STANDARDS SAME? | *y n* | | *y n* | | *y n* | |
| ACTION (TASK/CONTENT) SAME? | *y n* | | *y n* | | *y n* | |
| TYPICAL OF JOB? | *y n* | | *y n* | | *y n* | |
| FORMAT APPROPRIATE? | *y n* | | *y n* | | *y n* | |
| **ADEQUACY** | | | | | | |
| CLEAR? | *y n* | | *y n* | | *y n* | |
| UNAMBIGUOUS? | *y n* | | *y n* | | *y n* | |
| WELL-CONSTRUCTED? | *y n* | | *y n* | | *y n* | |
| FREE of HINTS? | *y n* | | *y n* | | *y n* | |

*REVISIONS*

Are COMMON ERRORS tested? *y n*

Are there ENOUGH ITEMS? *y n*

12

*COURSE TITLE* *OBJECTIVE #*

# PRESENTATION CONSISTENCY AND ADEQUACY

## CONSISTENCY

*REVISIONS*

Required PRESENTATION COMPONENTS Present? *y* *n*

Required PRESENTATION COMPONENTS Complete? *y* *n*

## ADEQUACY

STATEMENT ADEQUATE?

| | |
|---|---|
| Separate? | *y* *n* |
| Identified? | *y* *n* |
| Clear? | *y* *n* |
| Help? | *y* *n* |

EXAMPLES ADEQUATE?

| | |
|---|---|
| Separate? | *y* *n* |
| Identified? | *y* *n* |
| Clear? | *y* *n* |
| Help? | *y* *n* |
| Matching (concepts only)? | *y* *n* |
| Easy to hard? | *y* *n* |
| Enough? | *y* *n* |
| Common errors? | *y* *n* |

PRACTICE ADEQUATE?

| | |
|---|---|
| Separate? | *y* *n* |
| Identified? | *y* *n* |
| Clear? | *y* *n* |
| Free of hints? | *y* *n* |
| Easy to hard? | *y* *n* |
| Common errors? | *y* *n* |
| Enough? | *y* *n* |
| Feedback Separate? | *y* *n* |
| Feedback Identified? | *y* *n* |
| Feedback Help? | *y* *n* |

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Secretary Treasurer, U.S. Naval Institute
Science and Technology Division, Library of Congress
Coast Guard Headquarters (G-P-1/62)